Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01243, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01243
EGU General Assembly 2008

Extreme waves at the shoreline

M. Antuono (1) and M. Brocchini (2)

(1) D.I.C.A.T., University of Genova, via Montallegro 1, 16145 Genova, Italy, matteo.antuono@unige.it, (2) Istituto di Idraulica e Infrastutture Viarie, Università Politecnica delle Marche, Via Brecce Bianche 12, 60131 Ancona, Italy

On the basis of the approximate analytical solution for the Nonlinear Shallow Water Equations of Antuono & Brocchini (2007), we analyze in detail waves which start to break only near the shoreline. Indeed, such waves generate the strongest swash zone dynamics since they are the highest ones in the class of non-breaking waves and, at the same time, they have not suffered from any energy dissipation caused by breaking. As a first step in the analysis of such phenomenon, we propose useful regression formulae for the prediction of the maximum run-up and the dynamical forces in the swash zone on a frictionless, uniformly-sloping beach for non-breaking waves. For the first time the dependence of the results on both the wave height and the wave steepness is analyzed in detail providing formulae able to describe a wide class of wave inputs. We then derive the regression formulae for the prediction of wave breaking at the shoreline obtaining useful relations between the wave height and the wave steepness. To check the validity of the results, the regression formulae for both maximum run-up and wave breaking are compared with maximum run-up laws and breaking conditions already available in the literature. In all the cases, the results obtained through the model of Antuono & Brocchini (2007) appear to better account for nonlinear effects. Finally, we merge the previous expressions obtaining the regression formulae for both maximum run-up and dynamical forces for waves which start to break at the shoreline. The results confirm the initial inference about the exceptionally strong dynamics of the swash zone and provide powerful tools for the prediction of the sea/structure interactions.